



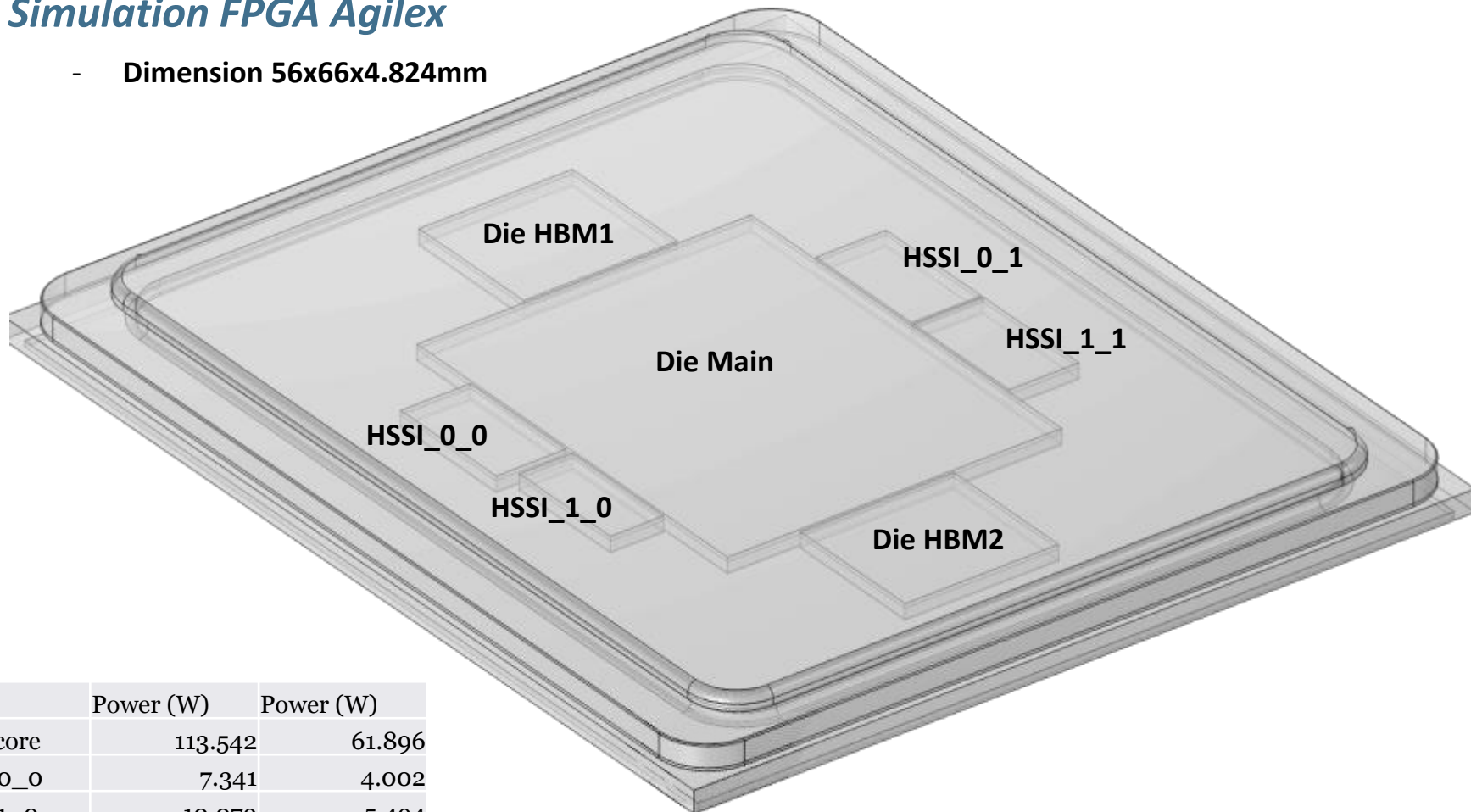
PCIe400 Thermal Model

Jean-Marc NAPPA on behalf of the LAPP team



Simulation FPGA Agilex

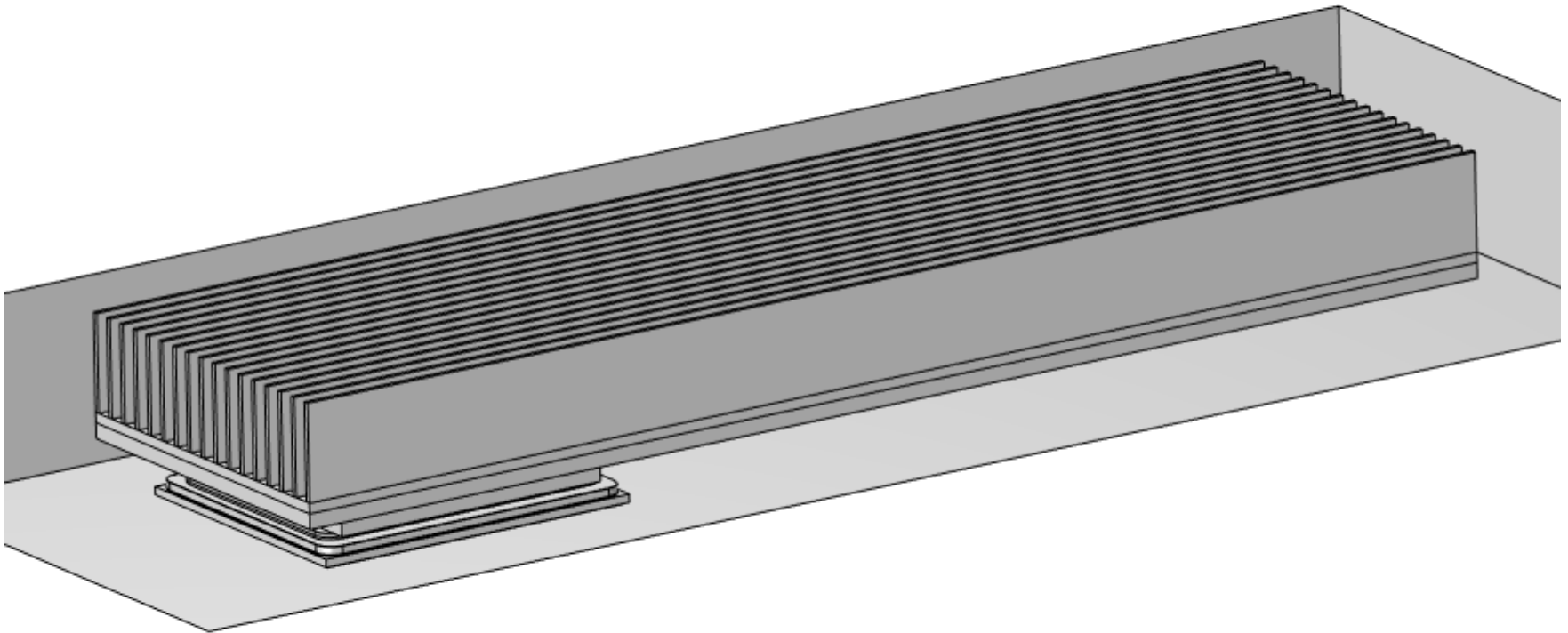
- Dimension 56x66x4.824mm



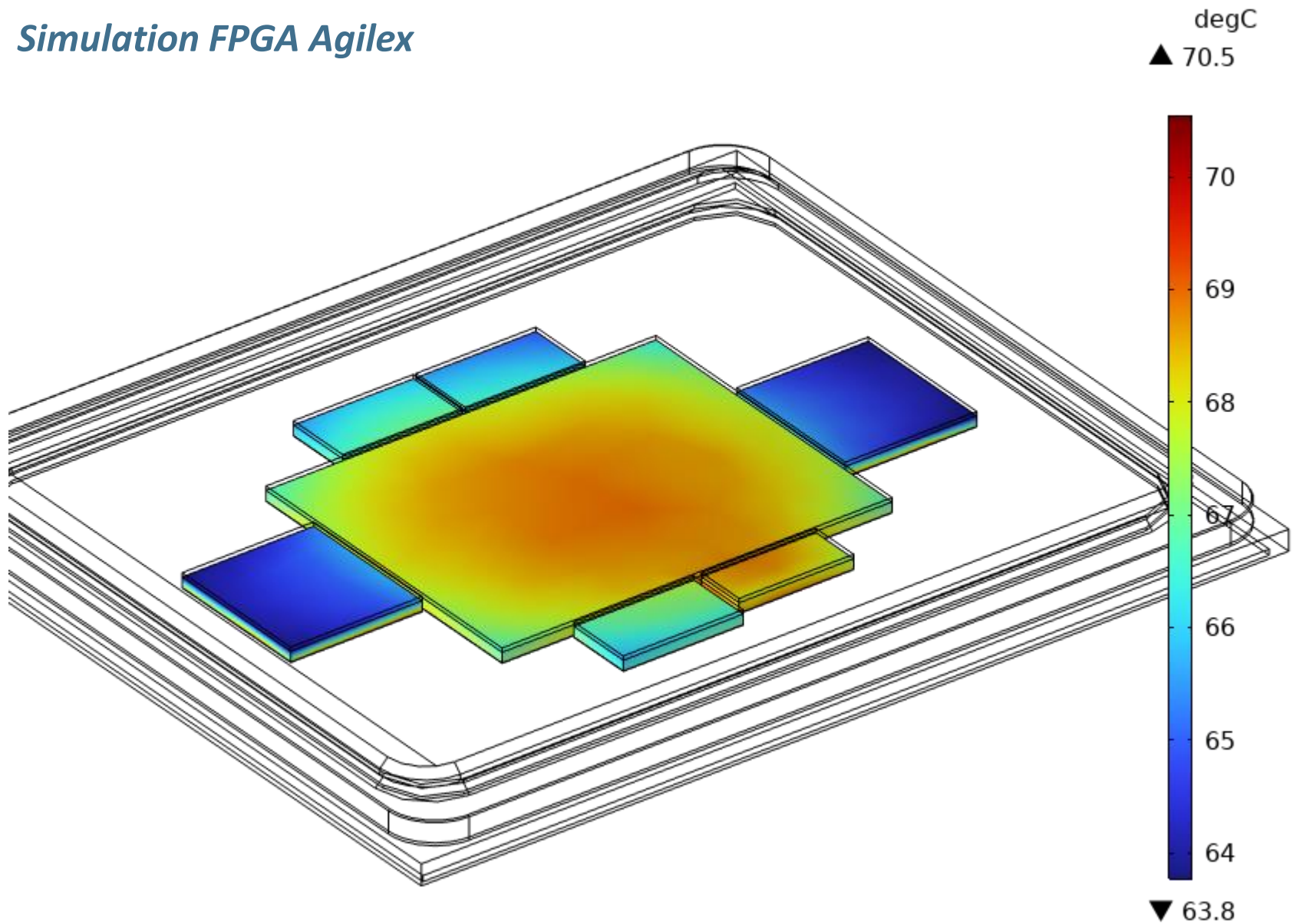
Die	Power (W)	Power (W)
FPGA core	113.542	61.896
HSSI_o_o	7.341	4.002
HSSI_1_o	10.079	5.494
HSSI_o_1	6.861	3.740
HSSI_1_1	4.94	2.693
u50_Hbm2e	6.577	3.585
u51_hbm2e	6.585	3.590
TOTAL	155.925	85

Simulation FPGA Agilex

- Heat Sink 254x70x21mm with Fins 17x1mm (Aluminum)
- Vapor Chamber 254x70x3mm with Encoche 56.3x52x5.4mm (Copper)
- Volume Air 312x100x35mm
- Tamb : 38 °C
- Heat source : 156 W



Simulation FPGA Agilex



Simulation FPGA Agilex

Uo (m/s)	T_Die (degC)	T_IHS (degC)	Rθ J-C (degC/W)
1.0000	116.89	112.88	0.025713
2.0000	80.182	76.172	0.025723
3.0000	68.020	64.009	0.025724

Uo (m/s)	T_IHS (degC)	T_VC (degC)	Rθ C-V (degC/W)
1.0000	112.88	111.96	0.0058748
2.0000	76.172	75.236	0.0059976
3.0000	64.009	63.052	0.0061388

Uo (m/s)	T_VC (degC)	T_HeatSink (degC)	Rθ V-S (degC/W)
1.0000	111.96	111.38	0.0037640
2.0000	75.236	74.635	0.0038563
3.0000	63.052	62.447	0.0038769

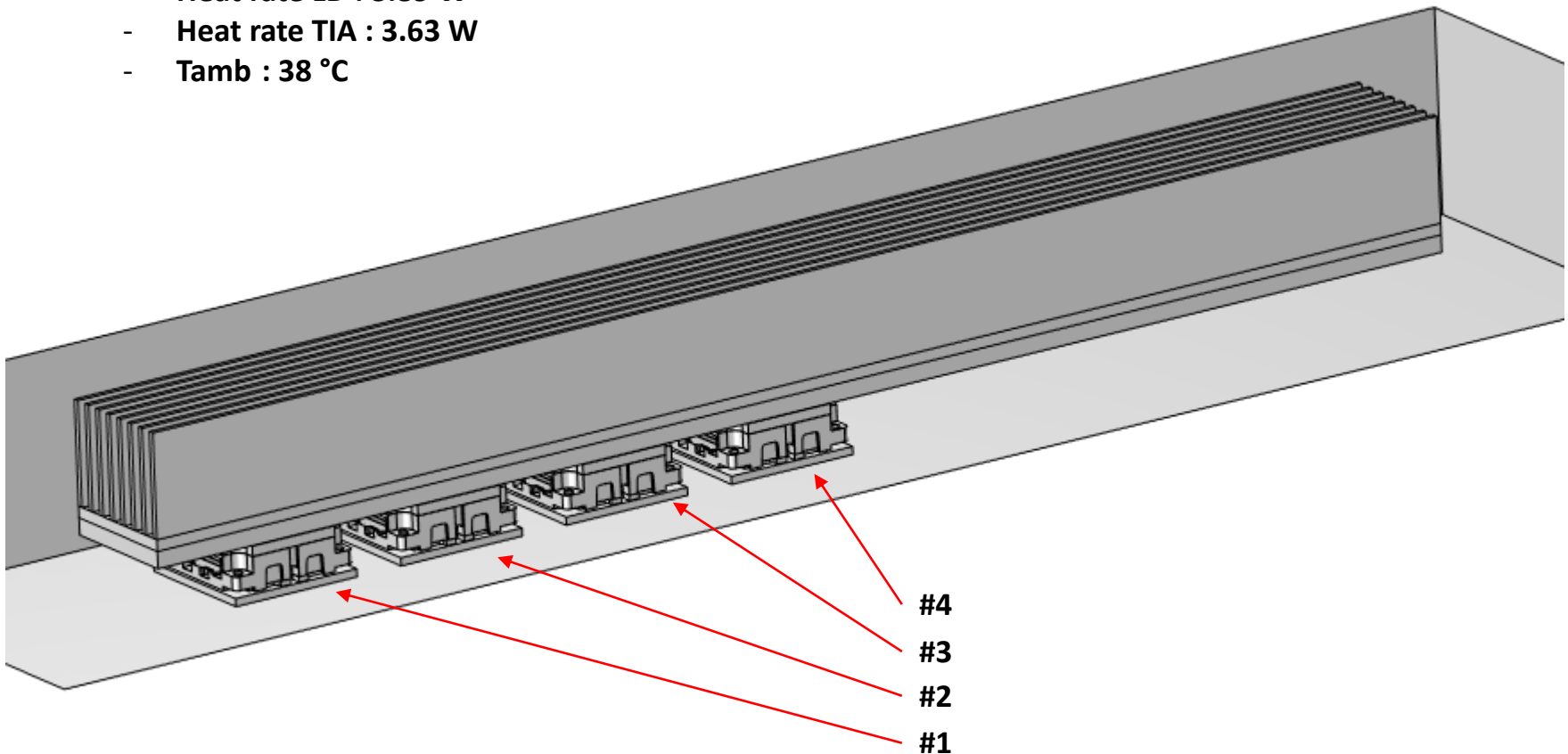
Simulation FPGA Agilex

Uo (m/s)	T_HeatSink (degC)	Tamb (degC)	Rθ S-A (degC/W)
1.0000	111.38	38.000	0.47060
2.0000	74.635	38.000	0.23495
3.0000	62.447	38.000	0.15679

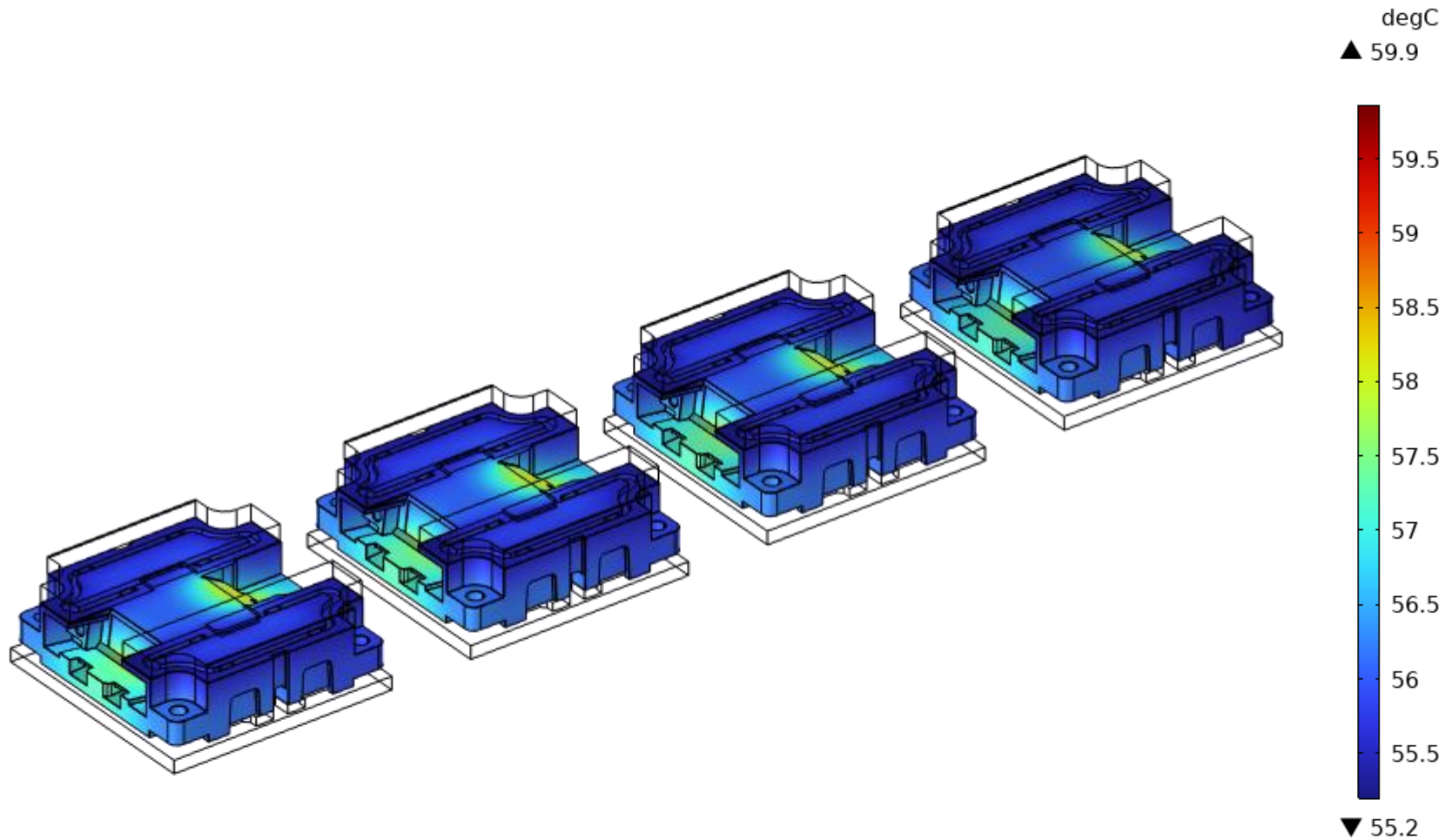
Uo (m/s)	T_Die (degC)	Tamb (degC)	Rθ J-A (degC/W)
1.0000	116.89	38.000	0.50595
2.0000	80.182	38.000	0.27053
3.0000	68.020	38.000	0.19253

OBT & VC & Heatsink

- Heat Sink 254x23x18.5mm with Fins 8x1mm (Aluminum)
- Vapor Chamber 254x23x3mm (Copper)
- Volume Air 312x60x35mm
- Heat rate LD : 3.89 W
- Heat rate TIA : 3.63 W
- Tamb : 38 °C



OBT & VC & Heatsink



OBT & VC & Heatsink

Uo (m/s)	T1 Case (degC)	T2 Case (degC)	T3 Case (degC)	T4 Case (degC)
1.0000	85.406	85.416	85.413	85.291
2.0000	64.082	64.087	64.074	63.963
3.0000	56.299	56.300	56.281	56.171

Uo (m/s)	T1 Die (degC)	T2 Die (degC)	T3 Die (degC)	T4 Die (degC)
1.0000	94.876	94.950	94.931	94.776
2.0000	73.570	73.639	73.608	73.459
3.0000	65.790	65.856	65.819	65.665

OBT & VC & Heatsink

Uo (m/s)	T_VC (degC)	T_HeatSink (degC)	OBT Rθ V-S (degC/W)	OBT Rθ S-A (degC/W)
1.0000	84.150	83.921	0.030440	6.1066
2.0000	62.804	62.581	0.029612	3.2688
3.0000	55.003	54.783	0.029355	2.2317

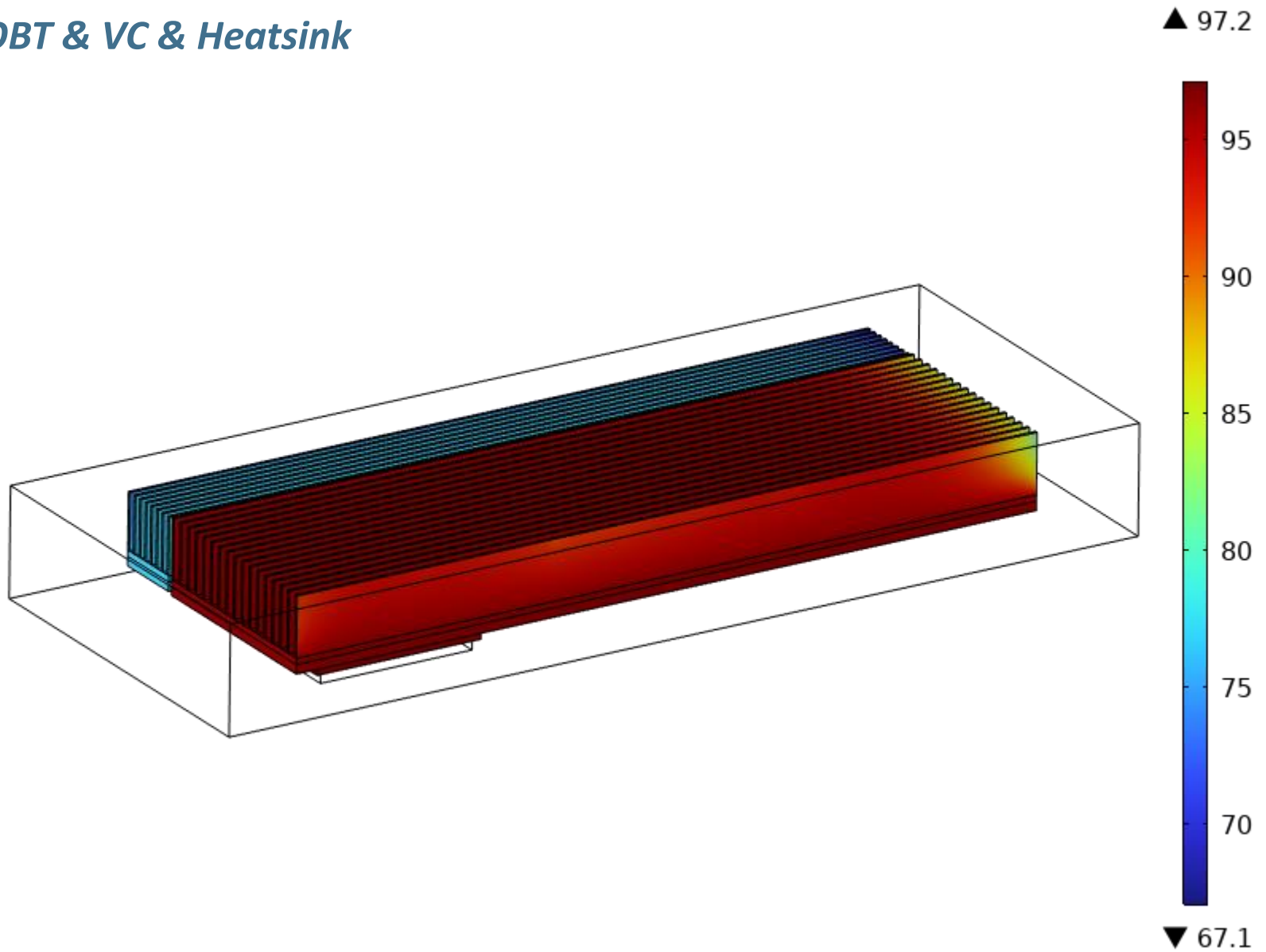
Uo (m/s)	T1_Die (degC)	T1_Case (degC)	T1_ZAdapter (degC)	OBT1 Rθ J-C (degC/W)	OBT1 Rθ C-ZAdapter (degC/W)	OBT1 Rθ J-A (degC/W)
1.0000	94.876	85.406	84.490	1.2592	0.12180	7.5632
2.0000	73.570	64.082	63.161	1.2616	0.12253	4.7300
3.0000	65.790	56.299	55.376	1.2622	0.12264	3.6955

Uo (m/s)	T2_Die (degC)	T2_Case (degC)	T2_ZAdapter (degC)	OBT2 Rθ J-C (degC/W)	OBT2 Rθ C-ZAdapter (degC/W)	OBT2 Rθ J-A (degC/W)
1.0000	94.950	85.416	84.493	1.2677	0.12275	7.5731
2.0000	73.639	64.087	63.161	1.2702	0.12313	4.7393
3.0000	65.856	56.300	55.375	1.2707	0.12305	3.7043

OBT & VC & Heatsink

Uo (m/s)	T3_Die (degC)	T3_Case (degC)	T3_ZAdapter (degC)	OBT3 Rθ J-C (degC/W)	OBT3 Rθ C-ZAdapter (degC/W)	OBT3 Rθ J-A (degC/W)
1.0000	94.931	85.413	84.492	1.2658	0.12236	7.5707
2.0000	73.608	64.074	63.155	1.2679	0.12217	4.7351
3.0000	65.819	56.281	55.364	1.2684	0.12197	3.6993
Uo (m/s)	T4_Die (degC)	T4_Case (degC)	T4_ZAdapter (degC)	OBT4 Rθ J-C (degC/W)	OBT4 Rθ C-ZAdapter (degC/W)	OBT4 Rθ J-A (degC/W)
1.0000	94.776	85.291	84.457	1.2614	0.11089	7.5501
2.0000	73.459	63.963	63.118	1.2628	0.11230	4.7152
3.0000	65.665	56.171	55.323	1.2625	0.11282	3.6789

OBT & VC & Heatsink



OBT & VC & Heatsink

Uo (m/s)	T_moy (degC)	RiseT_moy (K)	R_sa_moy (degC/W)	Tj_moy (degC)
1.0000	97.132	59.132	0.36958	103.21
2.0000	68.558	30.558	0.19099	74.638
3.0000	58.751	20.751	0.12969	64.831

Uo (m/s)	T1_moy (degC)	T2_moy (degC)	T3_moy (degC)	T4_moy (degC)
1.0000	76.550	76.549	76.545	76.539
2.0000	57.894	57.888	57.877	57.857
3.0000	51.509	51.499	51.480	51.448